JRM:lmp 1/30/06 EWG-143

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Hugh Anglin

Application No.: 09/826,616

Filed: April 5, 2001

For: INSPECTING PRINT QUALITY USING DIGITAL WATERMARKS

Examiner: J. Thompson

Date: January 30, 2006

Response Under 37 CFR § 1.116
Expedited Procedure

Art Unit: 2624
Conf. No.: 4050

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Joel R. Meyer
Attorney for Applicant

TRANSMITTAL LETTER

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Enclosed for filing in the above-captioned matter are the following:

☒ Appeal Brief (fee **$500.00**)

☒ Applicant petitions for a two month extension of time from November 29, 2005 to January 29, 2006. (fee **$450.00**)

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Respectfully submitted,

Date: January 30, 2006

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CUSTOMER NUMBER 23735

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PATENT
Attorney's Matter No. EWG-143

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Attorney for Applicant

APPEAL BRIEF

MAIL STOP APPEAL BRIEF-PATENTS
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Alexandria, VA 22313-1450

This Appeal Brief is in furtherance of the Notice of Appeal filed September 29, 2005. Please charge the fee required under 37 CFR 41.20 or any deficiency thereof to deposit account 50-1071 (see transmittal letter).

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I REAL PARTY IN INTEREST

The real party in interest is Digimarc Corporation, by an assignment from the inventor recorded at Reel 011995, Frames 0225-0227, on April 5, 2001.

II RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-5, 8-10, 12, 13 and 15-24 are finally rejected and appealed.

IV. STATUS OF AMENDMENTS

The amendment after final rejection filed on September 29, 2005, has been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As set forth in claim 1, one aspect of the invention is a method of inspecting printing, the method comprising:

digitally watermarking an image, said watermark being redundantly applied in areas of said image (e.g., page 3, lines 24-30, page 4, lines 2-7, page 5, lines 10-22);

printing said image on a carrier (e.g., page 5, lines 24-27);

acquiring a second image of the image printed on said carrier (e.g., page 4, lines 10-11, page 5, lines 29-30);

detecting the digital watermark from areas of said second image (e.g., page 4, line 12 to page 5 line 8, page 5, line 30 to page 6, line 29); and

determining an extent to which the digital watermark is detected in the areas as a measure of quality of the printing (e.g., page 4, line 14 to page 5, line 8, page 6, lines 3 to 29).

Claim 19 further modifies claim 1, reciting that strength of the digital watermark signal in the areas is used as a measure of print quality (e.g., page 2, lines 11-12, page 4, lines 14-15, page 4, line 28 to page 5, line 3, page 6, line 8).

Claim 20 further recites that strength of the digital watermark is measured as a function of spatial frequencies that have been modified to embed the digital watermark in the areas (e.g., page 4, lines 14-15, page 4, line 28 to page 5, line 3, page 6, line 8).

Claim 5 recites that the carrier is a label (e.g., page 3, lines 2-10), and the label is evaluated based on strength of watermark signal detected in the areas as the measure of the quality of the printing (e.g., page 4, lines 14-15, page 4, line 28 to page 5, line 3, page 6, line 8).

As set forth in claim 8, another aspect of the invention is a method of inspecting quality of printing, the printing including a first image that has been digitally modified to embed a digital watermark signal (e.g., page 3, lines 24-30, page 4, lines 2-7, page 5, lines 10-22) and printed on a carrier to create a printed image (e.g., page 5, lines 24-27), the method comprising:

acquiring a second image of said printed image (e.g., page 4, lines 10-11, page 5, lines 29-30);

reading said watermark signal from said second image to compute a measure of the digital watermark signal strength embedded in the second image (e.g., page 4, line 12 to page 5 line 8, page 5, line 30 to page 6, line 29); and

determining quality of said printing from the measure of the digital watermark signal strength (e.g., page 4, line 14 to page 5, line 8, page 6, lines 3 to 29).

Claim 22 further recites that strength of the digital watermark signal in areas of the image where the digital watermark is redundantly embedded is used as a measure of print quality (e.g., page 4, line 28 to page 5, line 3)

As set forth in claim 15, another aspect of the invention is a system for inspecting a printed image (e.g., Fig. 2 and Fig. 5 and accompanying text), said printed image including a digital watermark, said watermark being redundantly applied to areas of said printed image (e.g., page 3, lines 24-30, page 4, lines 2-7, page 5, lines 10-22), said system comprising:

an image capture device for acquiring an image of said printed image (e.g., camera 211, Fig. 2); a computer (e.g., computer 250, Fig. 2) that executes a watermark reading program (e.g., 251) for detecting a digital watermark signal from said areas of said image; and code for examining magnitude of the digital watermark signal in said areas as a measure of quality of said printing (e.g., page 4, lines 14-15, page 4, line 28 to page 5, line 3, page 6, line 8).

As set forth in claim 17, another aspect of the invention is a system for inspecting quality of printed labels, said labels being printed with an image which includes a digital watermark embedded in areas of said image, the system comprising:

means for acquiring an image of said labels after said labels have been printed (e.g., camera 211, Fig. 2);

means for detecting a watermark signal from the areas of said image of said labels (e.g., page 4, lines 10-11, page 5, lines 29-30); and

means for determining an extent to which the watermark signal is detected in the areas as a measure of print quality of said labels (e.g., page 4, line 14 to page 5, line 8, page 6, lines 3 to 29).

The above references to the specification are examples only and are not intended to be limiting.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

- Claims 1-2, 4, 8, 10, 12, 15-16, 19-20 and 22-23 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over U.S. Patent No. 5,915,027 to Cox et al. in view of U.S. Patent No. 6,064,764 to Bhaskaran et al. and U.S. Patent No. 6,363,162 to Moed et al.
- Claims 3, 5, 9, 13 and 17-18 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Cox in view of Bhaskaran, Moed, and U.S. Patent No. 5,488,223 to Austin et al. ("Austin")
- Claims 21 and 24 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Cox in view of Bhaskaran, Moed and U.S. Patent 6,243,480 to Zhao.

VII. ARGUMENT

Claims 1-2, 4, 8, 10, 12, 15-16, 19-20 and 22-23 are patentable over the combination of Cox, Bhaskaran, and Moed

Claim 1

The combined teachings of Cox, Bhaskaran, and Moed fail to teach or suggest "determining an extent to which the digital watermark is detected in the areas as a measure of

quality of the printing" in the novel combination of elements recited in claim 1. The Office acknowledges that Cox does not teach this aspect of claim 1 along with other elements.

Bhaskaran and Moed are cited as secondary references that allegedly teach the claim elements missing from Cox. Bhaskaran provides no teaching regarding the claimed processing of digital watermarks in images acquired from print. Bhaskaran merely states that digital images transmitted or stored in a computer may be viewed by printing. This statement does not indicate that Bhaskaran's method is applicable to printed images as claimed. Bhaskaran provides no teaching regarding processing a digital watermark in an image scanned from a printed image. In fact, Baskaran's method clearly only applies to detecting tampering of compressed digital images.

To consider this point, one must consider how Bhaskaran's method operates to see that it is inapplicable to the claims. Bhaskaran watermarks a compressed digital image, and then detects tampering of the watermarked compressed image, with no intervening decompression-printing-scanning and compression operations. In order to print Bhaskaran's watermarked compressed image, it would have to be decompressed and then rendered for printing. Then to apply Bhaskaran's tamper detect method, the printed image would need to be scanned and compressed because Bhaskaran's method applies to compressed images. The printing process and/or the subsequent scanning of the printed image would change all of the image data in a manner that the hash value or values of the re-compressed image would be changed. These hash values are central to Bhaskaran's tamper detection scheme. See Col. 6, lines 17-67. Any change in the hash results in a conclusion that the image data has been tampered with. Thus, Bhaskaran's method would indicate that all printed images have been tampered with, which provides no value when applied to printed images because it cannot distinguish between different levels of print quality. Because Bhaskaran's method, when hypothetically applied to printed images, would indicate that all printed images have been tampered with, it cannot provide the measure of print quality as claimed. The Examiner's position that determination of the level of tampering would also demonstrate the quality of the printing of the image is, therefore, incorrect.

In response to this argument, the Office argues that the test for obviousness is not whether the structure of the secondary reference may be bodily incorporated into the primary reference.

Rather, the test is what the combined teachings would have suggested to those of ordinary skill in the art.

Appellant's position is that because Bhaskaran is entirely inapplicable to printed images as claimed, it fails to teach or suggest the missing elements of Cox, and provides no suggestion to one of skill in the art to combine Bhaskaran's teachings with that of Cox. In order to provide some suggestion regarding the claim elements missing from Cox, it must teach the missing element and there must be a motivation to combine this teaching with that of the primary reference. However, Bhaskaran fails to teach or suggest: "determining an extent to which the digital watermark is detected in the areas as a measure of quality of the printing" as well as other missing elements from Cox.

The possibility that the watermark of Cox and Bhaskaran may have some similarity does not redress the deficiency that the combined teachings of all of the references fail to teach all of the elements of the claim. Moreover, this similarity is irrelevant to a significant deficiency in Bhaskaran in that Bhaskaran is not useful for print images. Because of this deficiency, one of ordinary skill in the art is highly unlikely to find teachings in Bhaskaran that would lead the skilled artisan to discover the claim elements missing from all of the references and then combine the teachings of these references with the newly discovered elements to arrive at the claimed invention.

Moed's teachings do not suggest any of the claim elements that are missing from Cox and Bhaskaran. Thus, the combined teachings of the references fail to teach all of the elements of the claim. Moreover, Moed does not provide any suggestion on how to modify Cox or Bhaskaran in a manner that would even remotely suggest the claim elements.

Claim 8

The combined teachings of Cox, Bhaskaran and Moed fail to teach "reading said watermark signal from said second image to compute a measure of the digital watermark signal strength embedded in the second image, and determining quality of said printing from the measure of the digital watermark strength" as recited in claim 8 in combination with the other claim elements. Again, Cox provides no suggestion regarding the use of its teachings for print.

None of the reference teaches a measure of embedded signal strength as a measure of print quality.

Claim 15

Regarding claim 15, the combined teachings of Cox, Bhaskaran and Moed fail to teach: "code for examining magnitude of the digital watermark signal in said areas as a measure of quality of said printing." Moreover, Cox provides no teaching regarding use of his technology in print. Bhaskaran and Moed do not teach the missing elements from Cox, and there is no motivation to combine these references to create the invention of claim 15. Therefore, the combination does not render claim 15 obvious.

Claim 19

The combined teachings of Cox, Bhaskaran and Moed fail to teach or suggest: "wherein strength of the digital watermark signal in the areas is used as a measure of print quality." Bhaskaran is cited as allegedly teaching this aspect of claim 19. However, Bhaskaran merely determines whether hash values have been modified, which conveys the same result, regardless of how strong the watermark is (even small changes to the compressed image data yields the same result as large distortion). Bhaskaran's method will always indicate that the hash does not match for a watermark in a printed image because printing modifies the watermark across the image. Bhaskaran's method, therefore, does not provide a measure of strength of the digital watermark signal in the areas as a measure of print quality as claimed. There is no suggestion of how to modify this method to make it usable with Cox or the other references.

Claim 20

The combined teachings of Cox, Bhaskaran and Moed fail to teach: "wherein strength of the digital watermark is measured as a function of spatial frequencies that have been modified to embed the digital watermark in the areas." The Office assumes that DCT domain watermarks necessarily teach this aspect of claim 20. However, as noted, Bhaskaran's hash does not provide a measure of strength as claimed, only whether DCT coefficients may have been altered in a manner that is unusable as a measure of print quality.

Claim 22

The combined teachings of Cox, Bhaskaran and Moed fail to teach: "strength of the digital watermark signal in areas of the image where the digital watermark is redundantly embedded is used as a measure of print quality." The Office has failed to identify how the teachings of these references correspond to all of the elements of this claim, including both the redundant embedding part and the use of strength of the digital watermark signal as a measure of print quality. The Office acknowledges that Cox does not teach elements of claim 22 and relies on Bhaskaran. There is no showing of how Bhaskaran teaches this unique combination of elements.

Claims 3, 5, 9, 13 and 17-18 are patentable over the combination of Cox, Bhaskaran, Moed, and Austin

Austin does not teach the missing elements from Cox, Bhaskaran and Moed. In addition, there is no motivation to combine these reference to make the invention of claims 3, 5, 9, 13, and 17-18.

Claim 5

None of the cited references teach: "wherein said label is evaluated based on strength of watermark signal detected in the areas as the measure of the quality of the printing."

Claim 17

Regarding claim 17, the combined teachings of Cox Bhaskaran, Austin and Moed fail to teach: "means for determining an extent to which the watermark signal is detected in the areas as a measure of print quality of said labels." The Office relies on Bhaskaran as teaching this aspect of claim 17. However, as explained previously, Bhaskaran is not usable in print as claimed because its fragile scheme would indicate that all printed images are tampered with, regardless of the print quality. As a result, Bhaskaran does not teach this aspect of the claim and provides no suggestion to the skilled artisan that might be usable in combination with the other references.

Claims 21 and 24 are patentable over the combination of Cox, Bhaskaran, Moed and Zhao. Zhao does not teach the missing elements from the other references, and therefore, the combination fails to teach all the elements of claims 21 and 24.

VIII. CONCLUSION

In view of the foregoing, the claims are patentable over the cited art. Applicant respectfully submits that the claims, therefore, should be allowed.

Respectfully submitted,

Date: January 30, 2006

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CLAIMS APPENDIX

Appealed Claims

1. A method of inspecting printing, the method comprising:
digitally watermarking an image, said watermark being redundantly applied in areas of said image;
printing said image on a carrier;
acquiring a second image of the image printed on said carrier;
detecting the digital watermark from areas of said second image; and
determining an extent to which the digital watermark is detected in the areas as a measure of quality of the printing.

2. The method recited in claim 1, wherein said watermark includes a signal embedded into the image at selected spatial frequencies.

3. The method recited in claim 1, wherein said carrier is a label.

4. The method recited in claim 1, wherein said second image is acquired using a digital camera.

5. The method recited in claim 3, wherein said label is evaluated based on strength of watermark signal detected in the areas as the measure of the quality of the printing.

8. A method of inspecting quality of printing, the printing including a first image that has been digitally modified to embed a digital watermark signal and printed on a carrier to create a printed image, the method comprising:
acquiring a second image of said printed image;
reading said watermark signal from said second image to compute a measure of the digital watermark signal strength embedded in the second image; and
determining quality of said printing from the measure of the digital watermark signal strength.

9. The method recited in claim 8, wherein said carrier is a label.

10. The method recited in claim 8, wherein said watermark comprises a signal embedded into the image at selected spatial frequencies.

12. The method recited in claim 8, wherein said watermark is redundantly embedded in multiple areas of said image.

13. The method recited in claim 12, wherein said carrier is a label.

15. A system for inspecting a printed image, said printed image including a digital watermark, said watermark being redundantly applied to areas of said printed image, said system comprising:
an image capture device for acquiring an image of said printed image; a computer that executes a watermark reading program for detecting a digital watermark signal from said areas of said image; and code for examining magnitude of the digital watermark signal in said areas as a measure of quality of said printing.

16. The system recited in claim 15, wherein said digital watermark includes a signal embedded into the image at selected spatial frequencies.

17. A system for inspecting quality of printed labels, said labels being printed with an image which includes a digital watermark embedded in areas of said image, the system comprising:
means for acquiring an image of said labels after said labels have been printed;
means for detecting a watermark signal from the areas of said image of said labels; and
means for determining an extent to which the watermark signal is detected in the areas as a measure of print quality of said labels.

18. The system recited in claim 17, wherein said digital watermark includes a signal embedded into the image at selected spatial frequencies.

19. The method of claim 1, wherein strength of the digital watermark signal in the areas is used as a measure of print quality.

20. The method of claim 19, wherein strength of the digital watermark is measured as a function of spatial frequencies that have been modified to embed the digital watermark in the areas.

21. The method of claim 1, wherein the digital watermark is embedded in a background image.

22. The method of claim 8, wherein strength of the digital watermark signal in areas of the image where the digital watermark is redundantly embedded is used as a measure of print quality.

23. The method of claim 22, wherein strength is measured as a function of spatial frequencies that have been modified to embed the digital watermark.

24. The method of claim 8, wherein the digital watermark is embedded in a background image.

EVIDENCE APPENDIX

There is no evidence appendix.

RELATED PROCEEDINGS APPENDIX

There is no related proceedings appendix.